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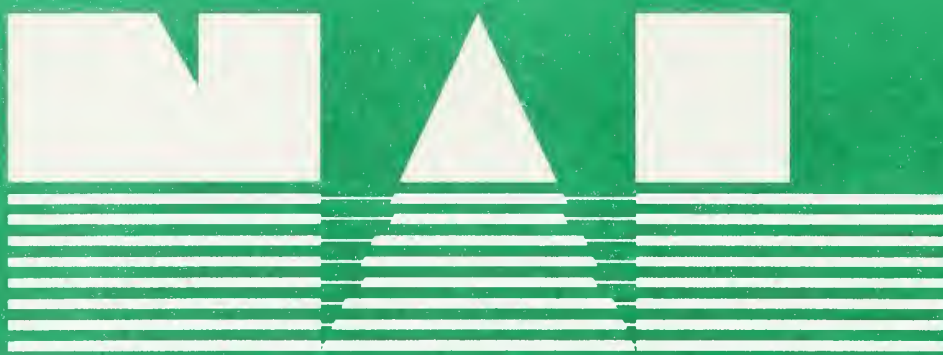
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1990 William Henry Hatch Memorial Lecture

**Warning:
Eating May
Be Harmful
to Your Health**

**United States
Department of
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Warning: Eating May Be Harmful to Your Health

William Henry Hatch Memorial Lecture

Presented by

Dr. Perry L. Adkisson

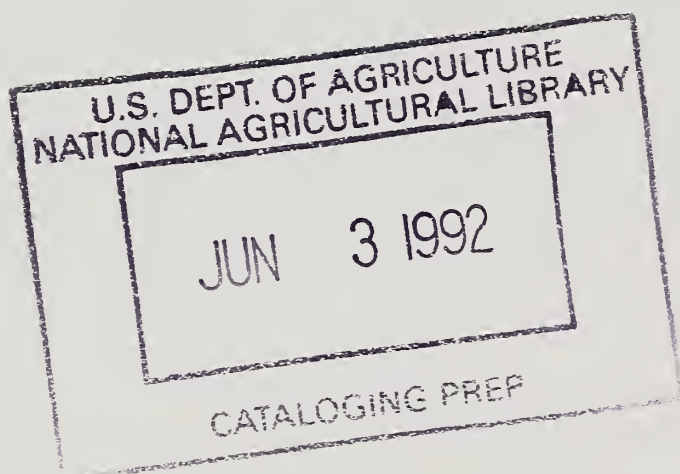
at the Annual Meeting of the

National Association of State Universities

and Land-Grant Colleges

Kansas City, Missouri

November 12, 1990



JAN 1991

The Cooperative State Research Service, USDA, sponsors the prestigious William Henry Hatch Memorial Lecture as a tribute to William Henry Hatch, the author of legislation creating the State Agricultural Experiment Station System.

The views expressed herein are those of the author and do not necessarily represent the views of the U.S. Department of Agriculture.



Dr. Perry L. Adkisson

Dr. Perry L. Adkisson is chancellor of the Texas A&M University (TAMU) system. Prior to assuming his present position, Chancellor Adkisson was deputy chancellor of the TAMU system. During his long career at TAMU, he served as vice president for Agriculture and Renewable Resources, head of the Department of Entomology, and holds the faculty designation of distinguished professor of entomology.

Dr. Adkisson holds a Ph.D. degree in entomology from Kansas State University, M.S. degree in agronomy, and B.S. degree in agriculture from the University of Arkansas. He was a postdoctoral fellow at Harvard University.

Chancellor Adkisson's research accomplishments have made him well known in the area of insect pest management and crop protection. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences. He is a fellow of the Entomological Society of America and has served as its president. He received the Alexander von Humboldt Award for outstanding contributions to American agriculture, the Distinguished Scientist of the Year Award from the Texas Academy of Sciences, the American Institute of Biological Sciences' Distinguished Achievement Award, the National 4-H Alumni Award, the Distinguished Alumnus Award from the University of Arkansas, and the Distinguished Alumnus Service Award from Kansas State University, among other notable honors.

Chancellor Adkisson currently serves as a member of the National Science Board. He is also a member of numerous national and international boards and committees, and has served as consultant to numerous national and international governmental agencies.

WARNING: Eating May Be Harmful to Your Health

It is an honor for me to be selected as the William Henry Hatch Lecturer for 1990. I am delighted by this honor and appreciate it very much. My lecture will not be learned, nor technical. It will not be in my professional field, but it will be on a subject that is of extreme interest to me and several million more people.

I have chosen the title “Warning: Eating May Be Harmful to Your Health” as a means of getting your attention; and because, the same as many of you, I am now experiencing a diet-related health problem.

No less an authority than the U.S. Surgeon General suggests that the food we eat is killing us. In the 1988 Surgeon General’s Report on Nutrition and Health, the 10 leading causes of death in the United States are listed (1).

Five of these causes—coronary heart disease, certain types of cancer, stroke, diabetes mellitus, and atherosclerosis—are known to be diet related. These diseases were responsible for approximately two-thirds of the 2.1 million deaths which occurred in the United States in 1987. (See Table)

Other maladies which are diet related, but not as life threatening as the above, include obesity, osteoporosis, dental diseases, and diverticular illnesses. These diseases affect millions of people, causing loss of productivity, suffering, and economic hardship.

The total costs of all these diseases in terms of premature deaths, suffering, loss of productivity and income of affected persons, health care, and disruption of families are enormous. Because these costs are so great, it would be a wise investment for the government to expand research to better identify the underlying causes of these diseases and develop the knowledge base needed to prevent them or reduce their severity.

Since these diseases are diet related, it should be possible to prevent them, delay their onset, or lessen their severity. The Surgeon General (1), the National Academy of Sciences (2, 3), the American Heart Association, the American Cancer Society, and others suggest a person can reduce the risk of being affected by one of these diseases by modifying the daily intake of food and by changing dietary habits. Typically, the actions recommended include the following: reduce consumption of fat (especially saturated fat) and cholesterol; eat more vegetables, fruits, and whole grain foods; substi-

tute fish and poultry for red meat, trimming fat from all meats; use low-fat dairy products; prepare food by methods that use little or no fat (especially saturated fat); increase consumption of complex carbohydrates and fiber; reduce sodium and sugar intake; and use alcohol in moderation, if at all.

These reports have gained the attention of the American public, and people are modifying their diets. They are fat and cholesterol conscious and trying to avoid heart attacks, strokes, and cancer. The same as most of you, I make a number of speeches each year to business, agricultural, professional, and service groups. A few years ago, the main topics of conversation centered around golf scores, the Dow-Jones average, commodity prices, hunting, fishing, and football. Today, it is cholesterol. Nearly everyone knows his or her cholesterol level, both HDL and LDL, and is on some kind of diet to either reduce or maintain it. This is not a fad. People are informed about the effects of dieting on health. They will be even more knowledgeable in the future. Their appetite for more healthful foods will continue to grow and will greatly impact the market for food products.

The American Cancer Society and the American Heart Association have picked up on this interest and are running advertisements in major publications, such as Newsweek and U.S. News and World Report, and are publishing cookbooks and pamphlets that urge us to eat foods that are more healthful. As food consumption patterns change, so will food production and processing practices. As agricultural scientists, we can react to these changes, or we can lead them.

Newspapers and the media constantly carry messages related to diet and health, providing all kinds of information on fat, cholesterol, and caloric content of various foods. They carry these items because they believe large numbers of readers are interested in them. A few weeks ago, I was in Washington, D.C., and took a few minutes to browse in the Walden Bookstore on 17th Street. You will be interested to learn that, in addition to the cookbooks previously mentioned, they had 18 books on diet and health. On the subject of production agriculture, there was only one and this was "Organic Gardening." To me, this limited survey indicates that among the general public we have a very large clientele interested in food, but a very small one interested in production agriculture. The diet-conscious clientele deserves much more of our attention.

All of this is indicative of the concern of U.S. consumers about nutrition, safety, and convenience of foods. They are concerned about how consumption of specific foods may relate to their personal health and well-being. Increased awareness of relationships between diet, nutrition, and health has changed our eating habits. Consumers are changing their diets for a healthier life by eating less fat and more fiber and complex carbohy-

drates; by reducing cholesterol, calories, and sodium intake; and perhaps, by moderating the intake of alcohol.

Producers of agricultural commodities are being asked to provide raw materials that processors can convert into foods that contain less fat fewer calories, decreased cholesterol, and more fiber. Meat industry groups are sponsoring research and development efforts to change their products to meet consumer needs. Food processors also are making efforts to develop improved foods, modified foods, and few foods to meet the demands of consumers for foods that are more healthful. There are great opportunities for research in each of these areas.

New, improved, or modified foods must “taste good” also and herein lies a difficulty. As the noted newspaper columnist Mike Royko wrote, “Be careful! If it tastes good, don’t eat it.” Dietary habits become ingrained in people during their early childhood and are among the most difficult of all habits to change. Few people ever completely change their dietary habits. For most, the change is for a few weeks, a few months, or even a few years before they gradually lapse back into the eating patterns of their formative years. Therefore, the ultimate solution to reducing the risk of diet-related diseases must be something other than modifying intake. We need to change the composition of food so that people can eat what they like with minimal risk.

The ideal solution would be to modify the composition of major food products, e.g., red meat, dairy products, and certain vegetables, reducing or eliminating those components (saturated fats, cholesterol, naturally occurring carcinogens, etc.) which contribute to the onset of diet-related diseases. At the same time, it should be possible to enhance those characteristics and compounds that might prevent (e.g., the tumor-inhibiting compounds in onions and garlic) or delay the onset of certain diseases.

These modifications might include:

- 1) changes in the chemical composition of fat by altering the composition of specific fatty acids;
- 2) reducing total fat and cholesterol;
- 3) increasing concentrations of tumor-inhibiting compounds;
- 4) decreasing quantities of carcinogens;
- 5) increasing fiber content and quantity of complex carbohydrates; and

6) optimizing other compounds which are found to be beneficial to good health.

Scientists in the State Agricultural Experiment Stations, the USDA Agricultural Research Service, and the food processing industry in the United States have the technical ability to modify the composition of food through breeding techniques, feeding/management systems for food animals, and processing technology. They have already demonstrated that they can change characteristics such as appearance, color, shape, texture, flavor, lean to-fat ratios, and tenderness. They have increased freshness and shelf life by reducing contamination by bacterial and fungal organisms, and adulteration by pesticides, preservatives, and other chemicals. In the field, scientists have created disease and pest-resistant varieties of plants that are drought-tolerant and more efficient users of sunlight, moisture, and fertilizer. They have produced disease-free food animals that are leaner and more efficient converters of plant material to meat. Recent pioneering experiments have demonstrated that the fatty acid composition of beef and pork can be modified by certain feeding and processing techniques (4, 5).

Thus, it is clear that we have the capability with modern science and conventional technology to modify the composition of foods. An even greater capability to make such changes will be possible with the emerging technologies of genetic engineering. Bioscience, biotechnology, and bioengineering will make it feasible to design and construct food products having the qualities needed to reduce the risk of dying from chronic diet-related diseases. *What the agricultural and food scientists do not have—and need—is the construction manual or roadmap needed to guide them in the process of modifying the composition of foods.*

How do we develop the construction manuals that will be required for making foods more healthful? The answer is simple: The specifications needed to create the new foods can come only from research conducted collaboratively by medical/nutritional scientists in the Nation's major medical research centers and plant and animal geneticists, animal nutritionists, and food scientists in the State Agricultural Experiment Stations and the USDA Agricultural Research Service. The medical/nutritional scientists must provide the specifications for the needed changes in food composition to the plant, animal, and food scientists, if they are to develop food products meeting these requirements. This critical linkage must be encouraged if we wish to take giant steps in improving the nutritional quality, safety, and healthfulness of food products.

Much of the technology required to modify food products is already in place, and much of what is needed is feasible. What is lacking are the linkages between scientists in the medical centers with those in the State and

Federal agriculture research entities. The lack of linkages occurs because agricultural and medical/human nutritional scientists travel in different circles, professionally and socially. There is very little personal interaction between them. As a result, there is very little joint research being conducted by agricultural and medical scientists on these tremendous health problems that present serious risks to the majority of U.S. citizens over 50 years of age. This is a national problem of major proportion that should not go unattended. Mechanisms must be developed to form linkages among medical, nutritional, and agricultural scientists that will lead to the cooperative research required to develop the knowledge base for modifying foods to reduce the risk of diet-related diseases. A scientific base for a new field of preventive medicine, agro-medicine, must be developed.

The appropriate agency for laying the foundation for expanding this area of cooperative research between agricultural and medical scientists is the National Academy of Sciences (NAS), and in this, the NAS should work in close cooperation with the U.S. Department of Agriculture (USDA). The NAS should initiate a second study on “designing foods” with the objectives of:

- 1) Suggesting the most promising areas of agro-medical research which would lead to:
 - a) Identification of the compounds and components in food products that are involved in the induction or prevention of diet-related diseases; and
 - b) Development of the scientific and technological bases for modifying foods to obtain the optimum composition and quality needed to reduce the risks of diet-related diseases.
- 2) Recommending ways to create and maintain the linkages between agricultural, medical, and nutritional research centers that will be needed to allow for adequate focus of scientific personnel and resources on these large and complex problems.
- 3) Recommending to the appropriate Federal agencies the development of new, novel, and adequate funding sources and research management procedures that will be required to implement these initiatives.

The National Academy of Sciences has done a first study on designing foods by examining animal product options in the marketplace (3). This study was very successful in helping the livestock industry and the U.S. Department of Agriculture to make some needed changes. Two important changes have been made in the beef grading system: changing the “Good”

grade to “Select,” and permitting hot-fat trimming by coupling yield and quality grades. The study endorsed a highly useful methodology for analyzing dietary consumption patterns of red meat in relation to nutritional targets, and it accelerated the red meat industry’s focus on reducing fat without reducing taste. However, this study was confined to meat and did not go far enough in identifying the research needed to modify foods to reduce the risk of chronic diet-related diseases. A second study is needed for this purpose.

Please let me repeat what I said in the beginning: The U.S. Surgeon General suggests that “the food we eat is killing us” with diet being involved in 5 of the 10 leading causes of death in the United States. This is a massive problem and one the land-grant universities of the United States should not ignore, because every problem is a research opportunity. Because we are the people who conduct the research related to the breeding of food plants and animals and the producing and processing of food, we should lead the way in developing the technologies needed to modify food products to reduce the risk of chronic diet-related diseases. Although I have not made a survey of current research in this area, I know that a few institutions already have initiated research programs aimed at modifying foods. For example, at Texas A&M University, animal scientists are working with the University of Texas Southwestern Medical Center in Dallas and the Baylor College of Medicine to alter the fat composition of beef and pork, and horticulturalists are working with M. D. Anderson Cancer Center in Houston to identify the products in onions and garlic which inhibit tumor formation. Texas A&M University also has under construction in the Texas Medical Center in Houston a major new research institute whose mission will be to advance this research by linking the Colleges of Agriculture and Life Sciences and Veterinary Medicine with the major heart, cancer, and atherosclerosis research institutions located there. Iowa State University recently broke ground for a new Center for Designing Foods to Improve Nutrition. The University of Illinois and Colorado State University are conducting research to modify the fatty acid composition of meat and for developing leaner carcasses. I am sure there are other institutions that are engaged in similar types of research programs. But considering the magnitude of the many factors involved in diet-related diseases, these efforts are pitifully small and lack the scope and focus that will be required to resolve the problem.

If I could be the Secretary of Agriculture, or the Assistant Secretary for Science and Education for a little while, I would take an initiative to Congress to obtain funding for a massive research program to develop new, improved, and modified foods to reduce the risk of chronic diet-related diseases. I would seek to create for this research greater, more innovative, and better managed funding sources. I would create five or six national

centers of excellence (centers, without walls) by identifying major medical research centers in the Northeast, Southeast, Midwest, Southwest, and Far West noted for their research on the nutritional triggers of cancer, heart disease, and strokes, and linking them to nearby State Agricultural Experiment Stations and USDA/ARS laboratories to do the research that will be needed to guide the modification of foods. This research might be complimented with a competitive grants program to fund innovative single investigators who have something to contribute to the solution of the problem. All of this research would be centrally managed with a mechanism for annual evaluations of performance and redirection of funds.

If you consider that 1.5 million Americans died of diet-related diseases in 1987 (1), a \$100-million-a-year initiative would not be unrealistic. The Federal Government this year has appropriated \$750 million for AIDS, a disease which killed 22,000 Americans in 1989, and 89,000 people since its first diagnosis in the United States. Thus, \$100 million for a new initiative on modifying foods to prevent or delay the onset of chronic diet-related diseases would not be inappropriate.

Please let me conclude with these remarks:

- (1) If you eat, you are involved in agriculture (and every person in the United States, has a stake in this problem);
- (2) The most dangerous knife in the house is a kitchen knife (and will remain so until we make foods more healthful); and
- (3) Eating may be harmful to your health. *But*, it doesn't have to be!

Ten Leading Causes of Death: United States, 1987.

Rank	Cause of Death	Number of Deaths	Percent of Total
1 ¹	Heart diseases	759,400	35.7
	<i>Coronary heart disease</i>	511,700	24.1
	<i>Other heart disease</i>	247,000	11.6
2 ¹	Cancers	476,000	22.4
3 ¹	Strokes	148,700	7.0
4 ¹	Unintentional injuries	92,500	4.4
	<i>Motor vehicle</i>	46,800	2.2
	<i>All others</i>	45,700	2.2
5	Chronic obstructive lung diseases	78,000	3.7
6	Pneumonia and influenza	68,600	3.2
7 ¹	Diabetes mellitus	37,800	1.8
8 ²	Suicide	29,000	1.4
9 ²	Chronic liver disease and cirrhosis	26,000	1.2
10 ¹	Atherosclerosis	23,100	1.1
	All Causes	2,125,100	100.00

¹ Causes of death in which diet plays a part.

² Causes of death in which excessive alcohol consumption plays a part.

SOURCE: Estimates from the National Center for Health Statistics, Monthly Vital Statistics Report, vol, 37, no. 1, April 25, 1988.



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